

WHAT IS CLAIMED IS:

1. A method for expanding the operating domain of a boiling water nuclear reactor, the operating domain characterized by a map of the reactor thermal power and core flow, said method comprising the steps of:

5 determining an elevated load line characteristic that improves reactor performance;

performing safety evaluations at the elevated load line to determine compliance with safety design parameters; and

performing operational evaluations at the elevated load line.

10 2. A method in accordance with Claim 1 wherein determining an elevated load line characteristic that improves reactor performance comprises the steps of increasing reactor thermal power to increase load line and evaluating reactor performance.

15 3. A method in accordance with Claim 1 wherein increasing reactor thermal power to increase load line comprises the step of adjusting the control rod pattern to increase reactor thermal power.

4. A method in accordance with Claim 1 wherein increasing reactor thermal power to increase load line comprises the step of adjusting the core flow to increase reactor thermal power.

20 5. A method in accordance with Claim 1 wherein increasing reactor thermal power to increase load line comprises the step of adjusting the control rod pattern and adjusting the core flow to increase reactor thermal power.

6. A method in accordance with Claim 2 further comprising the step of defining a set of operating conditions for the reactor in an upper operating domain characterized by the elevated load line.

7. A method in accordance with Claim 6 wherein the set of operating conditions permit operation of the reactor between about 120 percent of rated thermal power and about 85 percent of rated core flow to about 100 percent of rated thermal power and about 55 percent of rated core flow.

5 8. A method in accordance with Claim 1 wherein performing operational evaluations at the elevated load line comprises the steps of :

evaluating plant maneuvers;

evaluating frequent plant transients;

evaluating plant fuel operating margins;

10 evaluating operator training;

evaluating plant equipment response and setpoints.

9. A method in accordance with Claim 8 further comprising the step of establishing constraints and requirements for plant equipment and plant procedures based on the operational evaluations.

15 10. A method in accordance with Claim 8 further comprising the steps of performing a detailed analysis of the performance of the core recirculation system and performing a detailed analysis of the core recirculation system control components.

20 11. A method in accordance with Claim 9 further comprising the steps of providing automatic adjustment of the control rod pattern, the flow controls, and the pressure controls based on the detection of a reactor transient.

12. A method in accordance with Claim 9 further comprising the steps of modifying the reactor process controls and computers to permit the reactor to operate in the expanded operating domain within predetermined safety parameters.

13. A method in accordance with Claim 1 further comprising the step of creating a safety analysis report based on the safety evaluations.

14. A system for controlling a boiling water nuclear reactor, said system configured to:

5                   define a set of operating characteristics for the reactor in an upper operating region above 100 percent of a rated core thermal power;

                  evaluate an expected performance of the reactor throughout the upper operating region; and

10                   establish limits for the reactor that are to be observed within the upper operating region.

15. A system in accordance with Claim 14 wherein said system is further configured to define an upper boundary of the upper operating region.

15                   16. A system in accordance with Claim 14 wherein said system is configured to define a set of operating characteristics for the reactor to permit operation of the reactor between about 120 percent of rated thermal power and about 85 percent of rated core flow to about 100 percent of rated thermal power and about 55 percent of rated core flow.

17. A system in accordance with Claim 14 wherein said system is further configured to perform operational evaluations in the upper operating region.

20                   18. A system in accordance with Claim 17 wherein said system is further configured to establish constraints and requirements for plant equipment and plant procedures based on the operational evaluations.

19. A system in accordance with Claim 14 wherein said system is further configured to perform safety evaluations in the upper operating region.

20. A system in accordance with Claim 19 wherein said system is further configured to create a safety analysis report based on the safety evaluations.

21. A system in accordance with Claim 14 wherein said system is further configured to establish compliance with safety design parameters based on the safety evaluations.

22. A system in accordance with Claim 17 wherein said system is further configured to provide automatic adjustment of the control rod pattern, the flow controls, and the pressure controls based on the detection of a reactor transient.

23. A method for expanding the licensed operating domain of a boiling water nuclear reactor, the operating domain characterized by a map of the reactor thermal power and core flow, said method comprising the steps of:

providing analyses and evaluations to generate a safety analysis report;

providing licensing support; and

providing technical consultation.

24. A method in accordance with Claim 23 wherein providing analyses and evaluations comprise the steps of:

determining an elevated load line characteristic that improves reactor performance;

performing safety evaluations at the elevated load line to determine compliance with safety design parameters; and

performing operational evaluations at the elevated load line.

25. A method in accordance with Claim 24 further comprising the step of defining a set of operating conditions for the reactor in an upper operating domain characterized by the elevated load line.

26. A method in accordance with Claim 25 wherein the set of operating conditions permit operation of the reactor between about 120 percent of rated thermal power and about 85 percent of rated core flow to about 100 percent of rated thermal power and about 55 percent of rated core flow.

5                    27. A method in accordance with Claim 24 wherein performing operational evaluations at the elevated load line comprises the steps of :

                         evaluating plant maneuvers;

                         evaluating frequent plant transients;

                         evaluating plant fuel operating margins;

10                    evaluating operator training;

                         evaluating plant equipment response and setpoints.

28. A method in accordance with Claim 27 further comprising the step of establishing constraints and requirements for plant equipment and plant procedures based on the operational evaluations.

15                    29. A method in accordance with Claim 28 further comprising the steps of performing a detailed analysis of the performance of the core recirculation system and performing a detailed analysis of the core recirculation system control components.

20                    30. A method in accordance with Claim 28 further comprising the steps of providing automatic adjustment of the control rod pattern, the flow controls, and the pressure controls based on the detection of a reactor transient.

31. A method in accordance with Claim 28 further comprising the steps of modifying the reactor process controls and computers to permit the reactor to operate in the expanded operating domain within predetermined safety parameters.

32. A method in accordance with Claim 24 further comprising the step of creating a safety analysis report based on the safety evaluations.